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(54) **ILLUMINATOR DEVICE**

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(Continued)

(56) **References Cited**

U.S. PATENT DOCUMENTS

10,030,819 B2 * 7/2018 Athalye F21V 29/77
2005/0174780 A1 * 8/2005 Park F21V 29/506
362/294
(Continued)

FOREIGN PATENT DOCUMENTS

CN 201259106 Y 6/2009
CN 103453335 12/2013
(Continued)

OTHER PUBLICATIONS

International Search Report (including English translation) and Written Opinion issued in PCT/CN2017/083628, dated Aug. 8, 2017, 13 pages.

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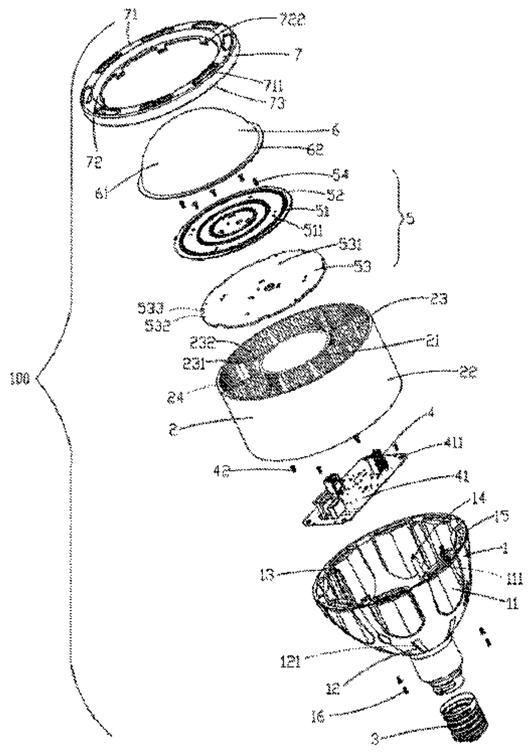
(57) **ABSTRACT**

The present disclosure discloses an illuminator device including a housing, a heat dissipation member at an end of the housing, a light source module configured to include an end in thermal contact with the heat dissipation member, an optical member at another end of the light source module, and a driving power supply module; the light source module and the housing are respectively provided at two ends of the heat dissipation member; by the additional heat dissipation member in the illuminator device and a plurality of channels communicating inside with outside of the illuminator device and penetrating through the housing and the heat dissipation member, the heat emitted by the light source module in the illuminator device can be effectively and rapidly dissipated through the channels.

17 Claims, 8 Drawing Sheets



(51) **Int. Cl.**

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F21K 9/238	(2016.01)
F21V 23/00	(2015.01)
F21V 29/77	(2015.01)
F21Y 115/10	(2016.01)
F21Y 105/18	(2016.01)
F21Y 103/33	(2016.01)

(52) **U.S. Cl.**
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(58) **Field of Classification Search**
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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2008/0158887	A1*	7/2008	Zhu	F21V 29/745 362/294
2009/0046473	A1*	2/2009	Tsai	F21V 29/773 362/373
2009/0141500	A1*	6/2009	Peng	F21K 9/233 362/294
2009/0296402	A1*	12/2009	Chang	F21K 9/238 362/294
2010/0232168	A1*	9/2010	Horng	F21V 29/677 362/373
2010/0277067	A1*	11/2010	Maxik	F21V 3/00 315/32
2011/0204790	A1*	8/2011	Arik	F21K 9/238 315/113
2012/0161602	A1*	6/2012	Yu	F21V 29/83 313/46
2012/0194055	A1*	8/2012	Wu	F21V 29/773 313/46
2012/0248961	A1*	10/2012	Lai	F21K 9/238 313/46
2013/0128589	A1*	5/2013	Kim	F21V 29/67 362/294
2013/0163240	A1	6/2013	Chen	
2013/0223061	A1*	8/2013	Hwu	F21V 29/74 362/235
2013/0257278	A1*	10/2013	DeVore	F21V 23/06 315/113
2014/0063809	A1*	3/2014	Huang	F21V 29/773 362/294
2015/0211723	A1*	7/2015	Athalye	F21V 29/77 362/294

FOREIGN PATENT DOCUMENTS

CN	204437777	U	7/2015	
CN	204629144	U	9/2015	
CN	106051646		10/2016	
CN	205806983	U	12/2016	
JP	5600936	B	7/2011	
WO	WO-2012129893	A1 *	10/2012	F21V 29/773

* cited by examiner

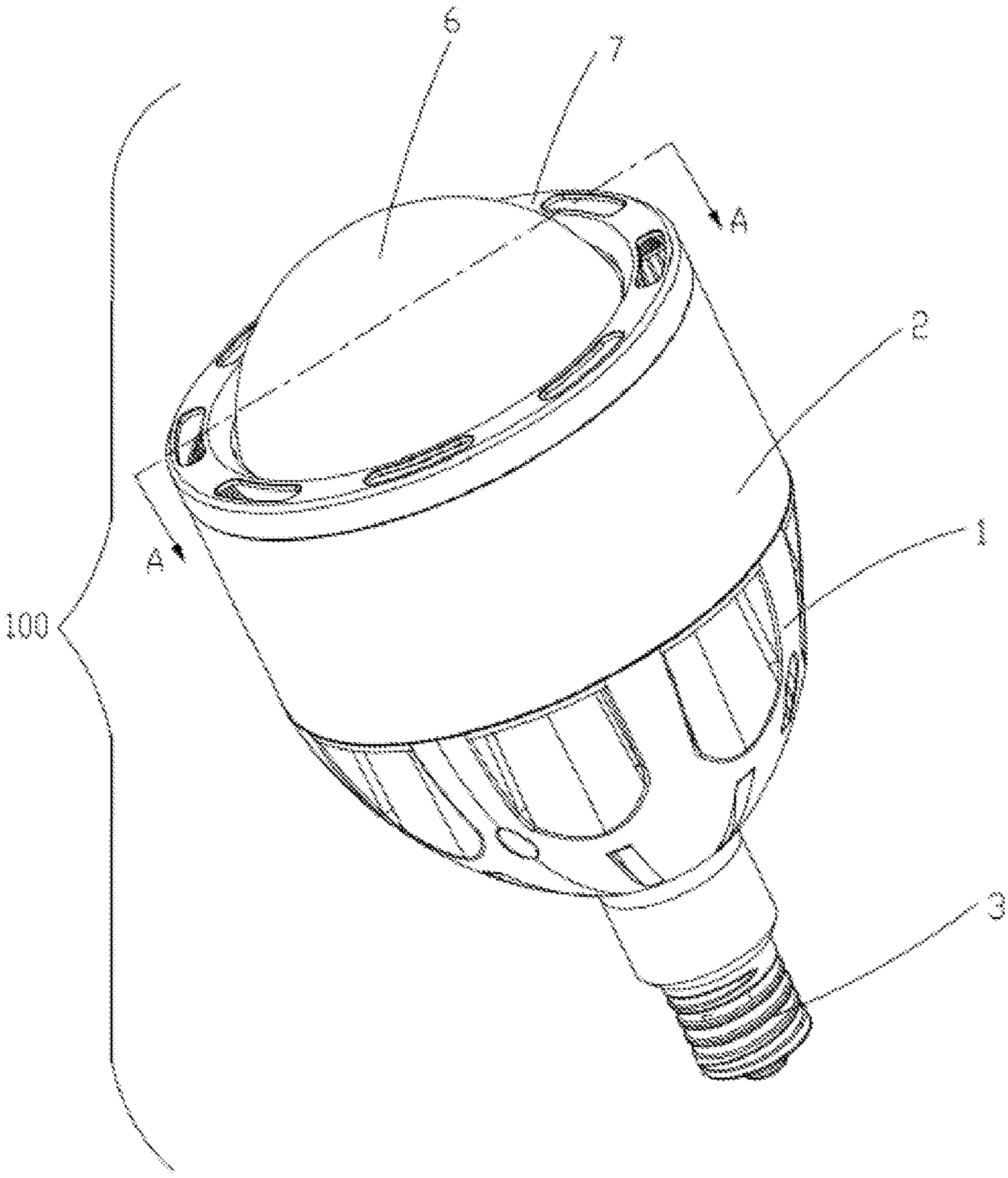

FIG. 1

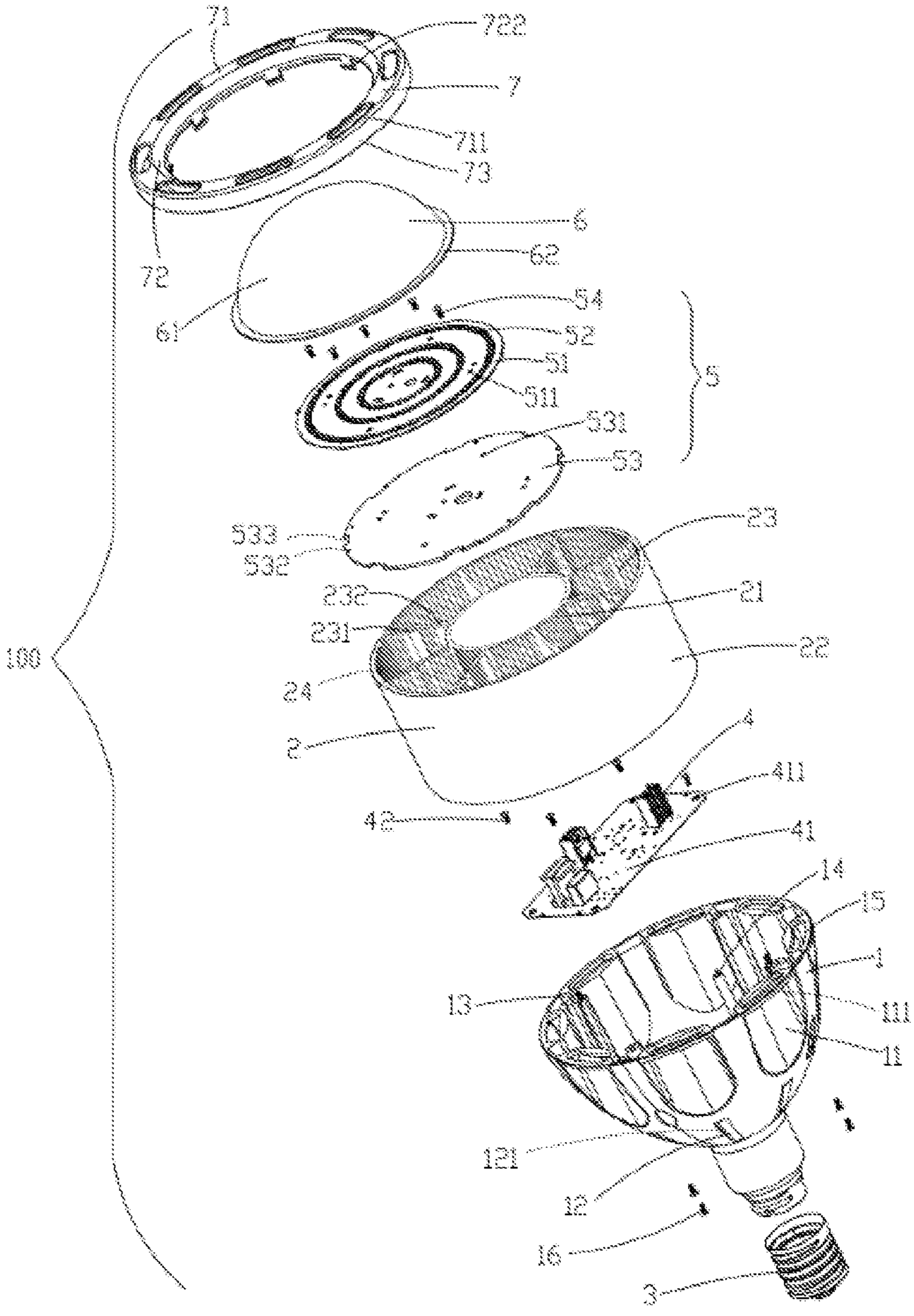
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FIG. 2

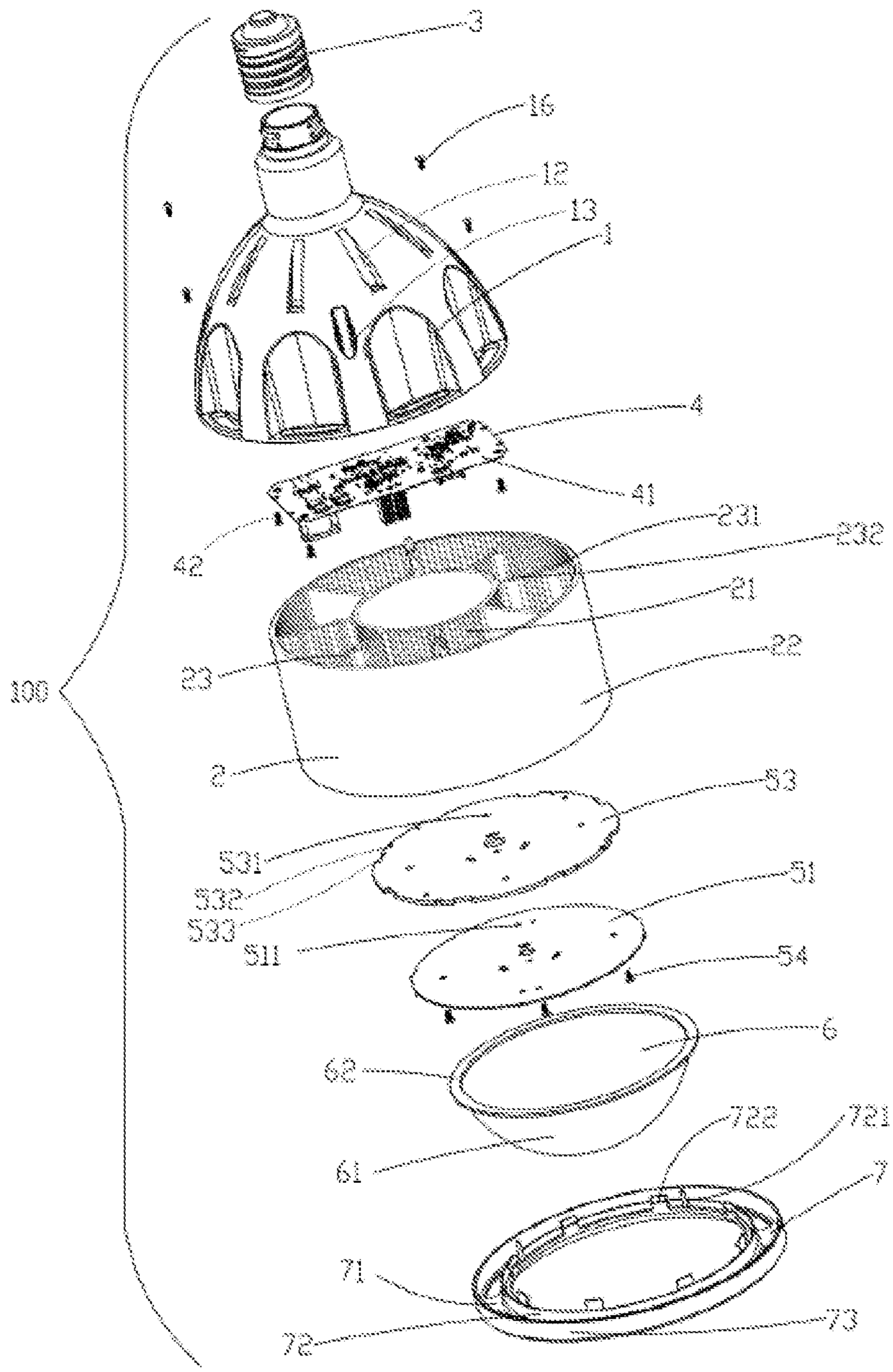
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FIG. 3

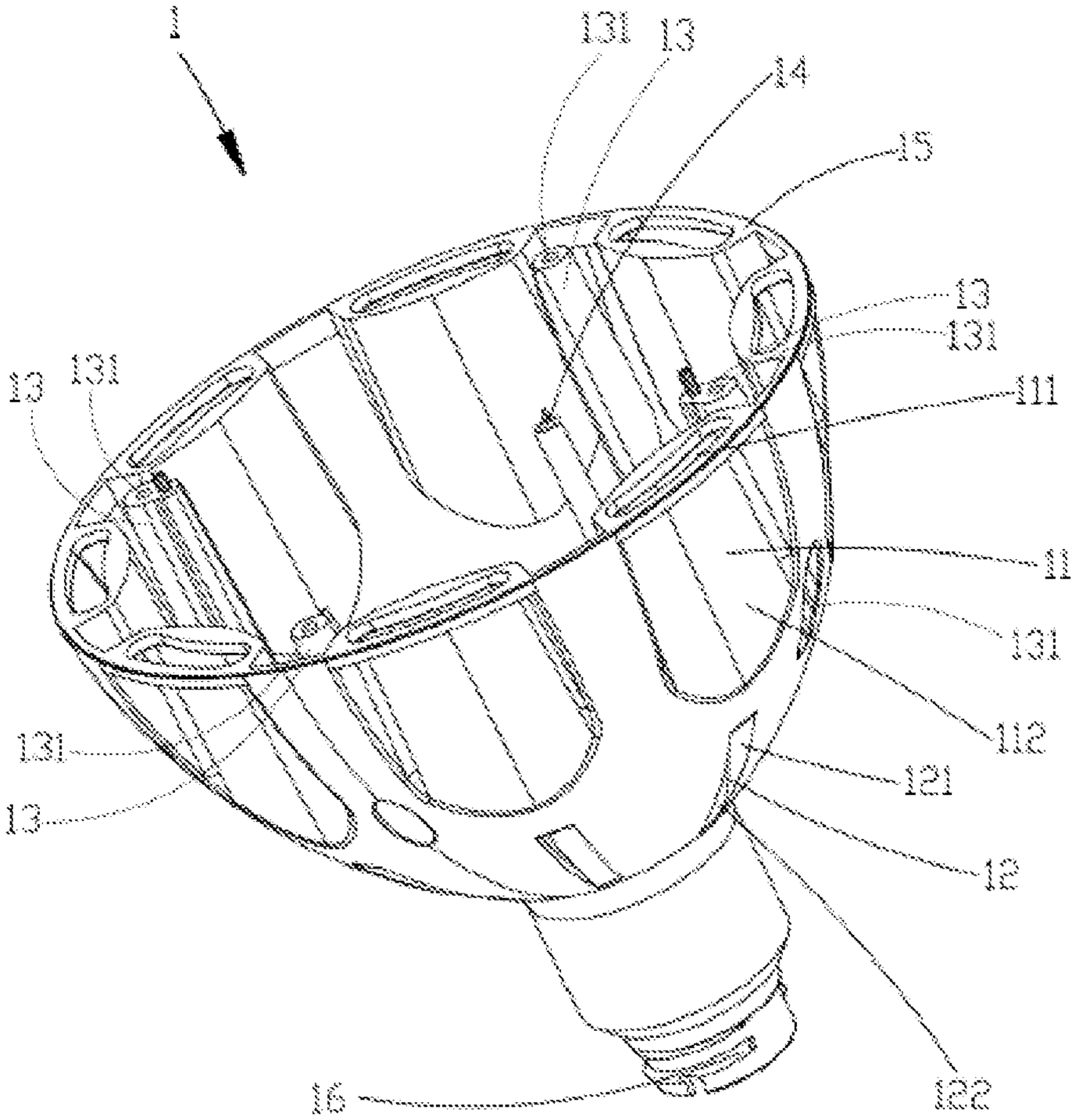

FIG. 4

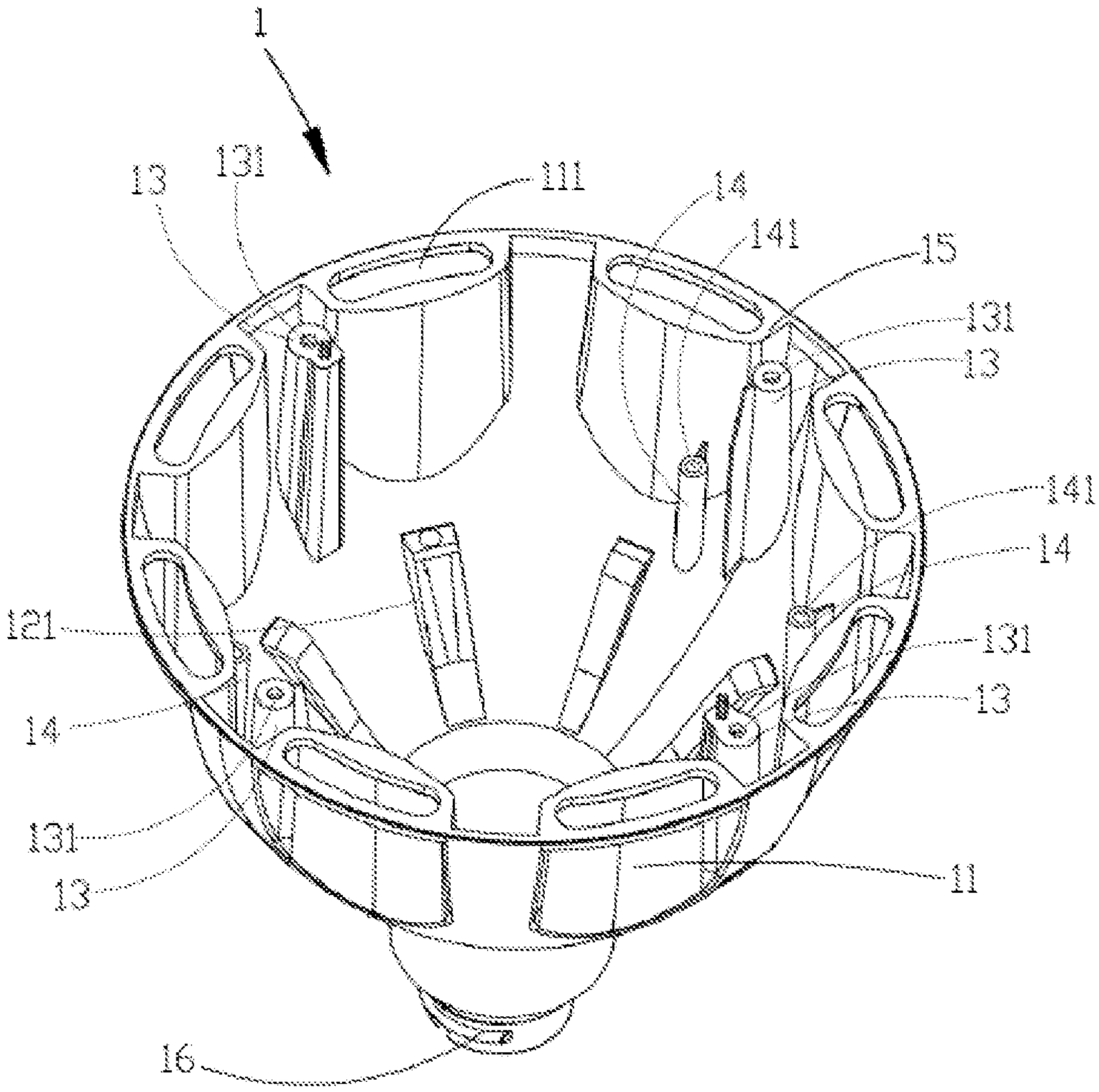

FIG. 5

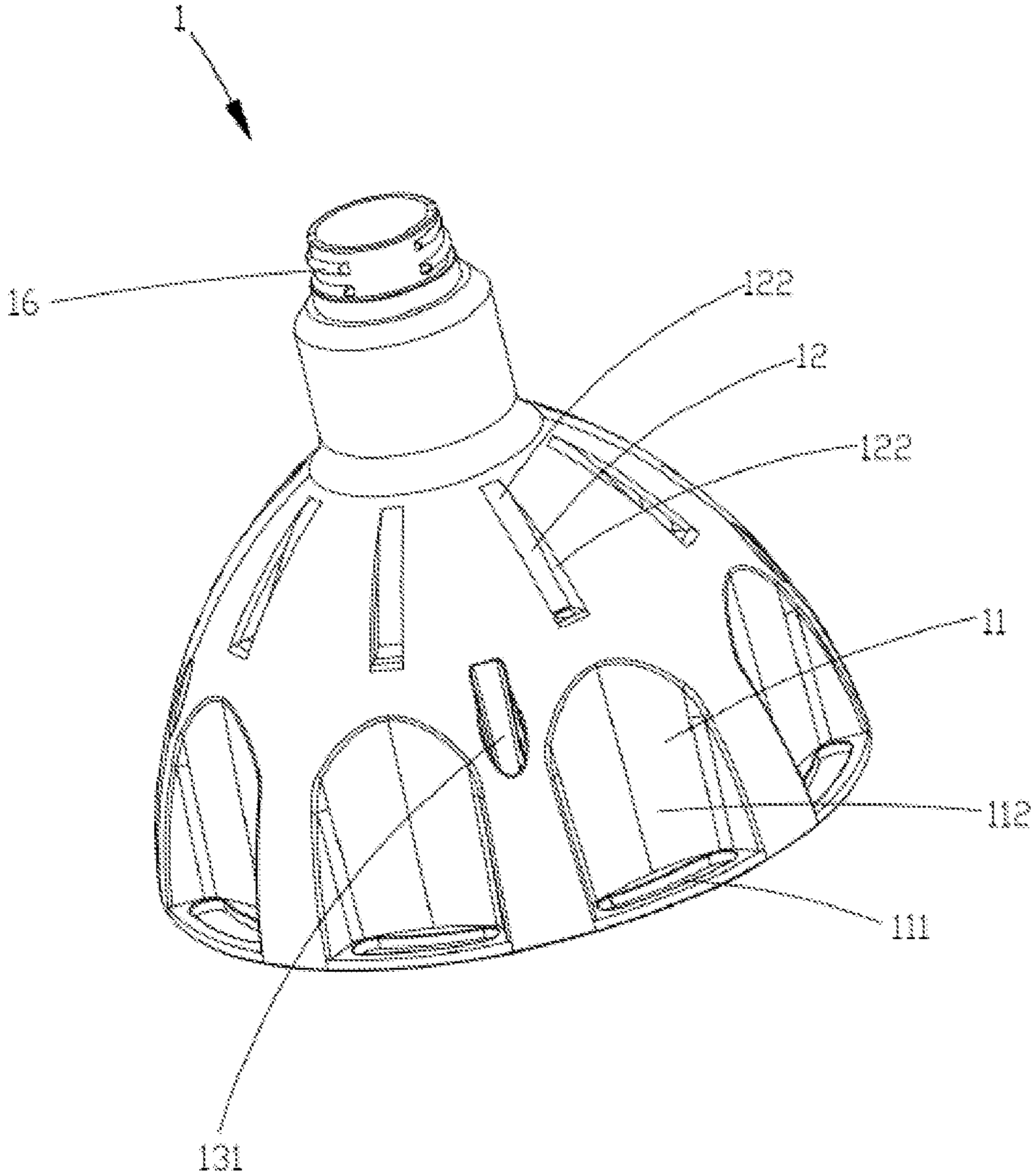

FIG. 6

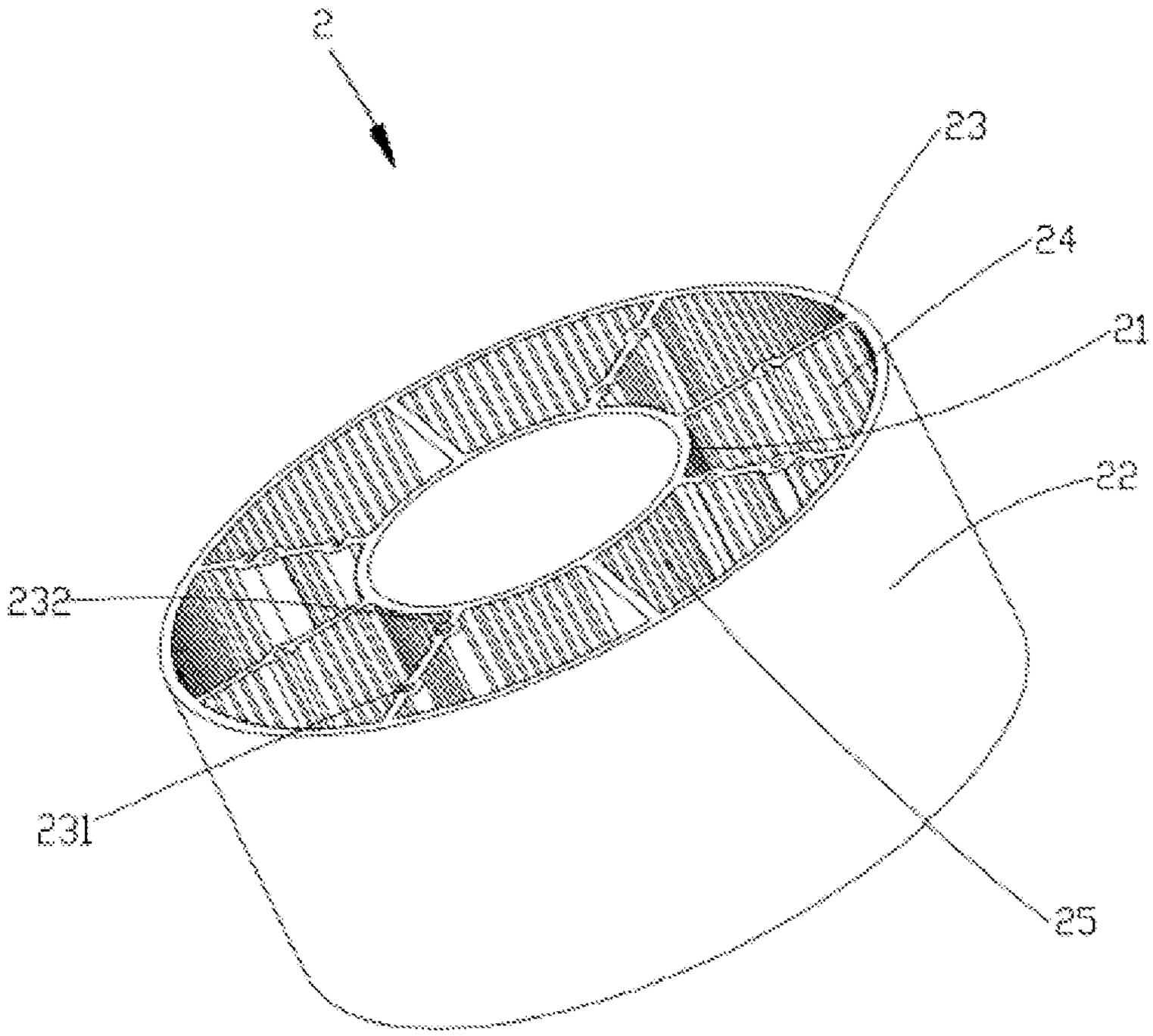

FIG. 7

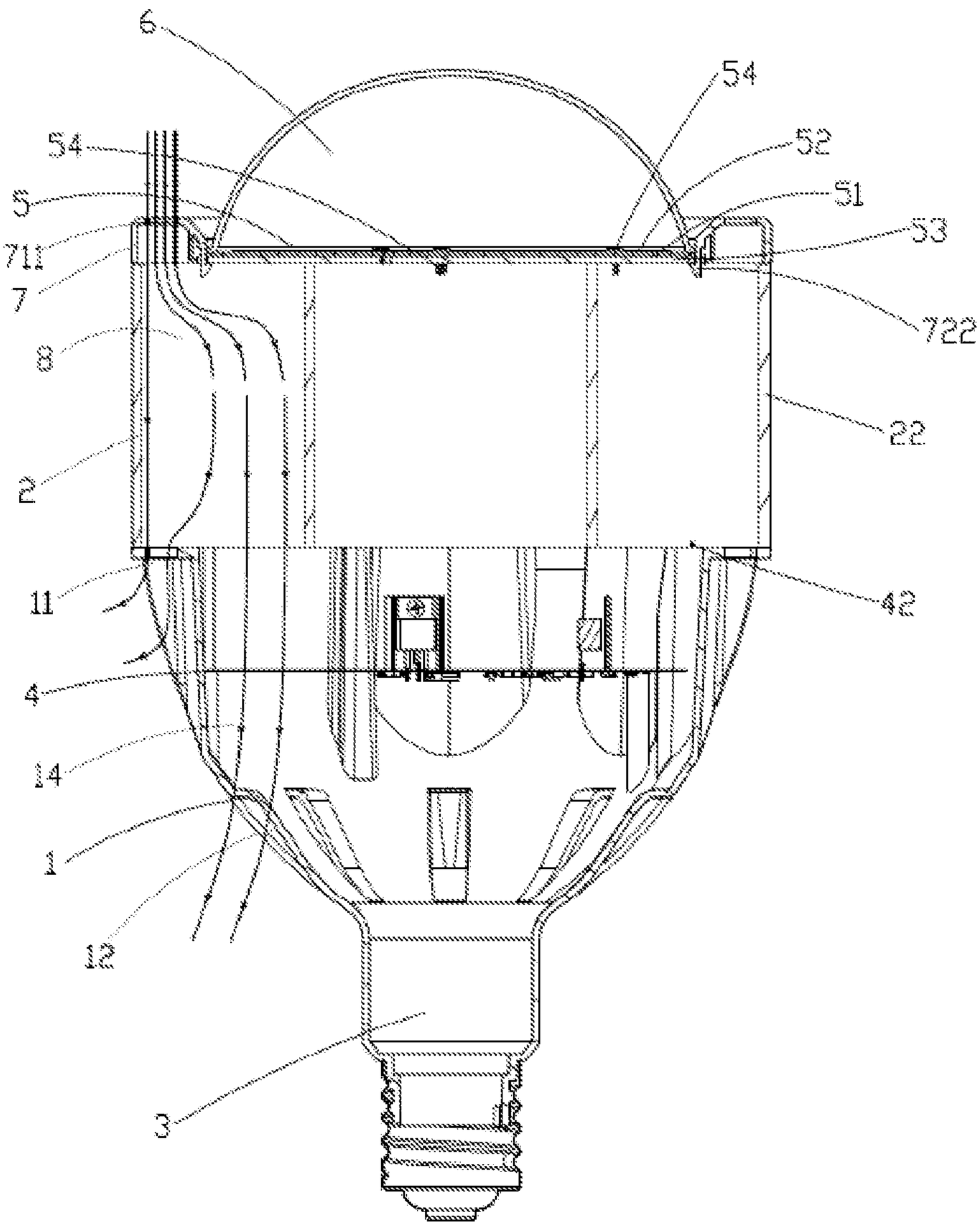

FIG. 8

ILLUMINATOR DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is based upon and claims the priority of PCT patent application No. PCT/CN2017/083628 filed on May 9, 2017 which claims the priority of Chinese Patent Application No. 201610463893.2 filed on Jun. 23, 2016 and Chinese Patent Application No. 201620630935.2 filed on Jun. 23, 2016, the entire content of all of which is hereby incorporated by reference herein for all purposes.

TECHNICAL FIELD

The present disclosure belongs to the field of semiconductor illumination technology, and in particular relates to an illuminator device.

BACKGROUND

After a lamp, especially a high-power lamp, is illuminated and is used for a period of time, the temperature of the entire lamp can be high, and the service life of the lamp can be greatly shortened if the lamp cannot effectively dissipate heat. Therefore, the high-power lamp is generally provided with a heat dissipation structure between a lamp housing and an encloser.

SUMMARY

The present disclosure provides an illuminator device and a method of manufacturing an illuminator device.

According to a first aspect, the present disclosure provides an illuminator device. The device may include: a housing, a heat dissipation member provided at an end of the housing, a light source module configured to include an end in thermal contact with the heat dissipation member, an optical member provided at an other end of the light source module, and a driving power supply module electrically connected with the light source module, where the light source module and the housing are respectively provided at two ends of the heat dissipation member, a plurality of channels communicating inside of the illuminator device with outside of the illuminator device are provided in the illuminator device, and the plurality of channels penetrate through the housing and the heat dissipation member.

According to a second aspect, the present disclosure provides a method of manufacturing an illuminator device. The method may include: providing a housing and a heat dissipation member provided at an end of the housing, providing a light source module configured to include an end in thermal contact with the heat dissipation member, providing an optical member provided at an other end of the light source module, and providing a driving power supply module electrically connected with the light source module, and where the light source module and the housing may be respectively provided at two ends of the heat dissipation member, a plurality of channels communicating inside of the illuminator device with outside of the illuminator device are provided in the illuminator device, and the plurality of channels penetrate through the housing and the heat dissipation member.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only and are not restrictive of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings illustrated here are only provided for further understanding of the present disclosure and constitute one part of the present disclosure. The examples of the present disclosure and the description thereof are used for explaining the present disclosure and do not constitute an improper limitation of the present disclosure. In the accompanying drawings:

FIG. **1** is a schematic three-dimensional assembly view of an illuminator device provided by an example of the present disclosure;

FIG. **2** is a schematic exploded view of FIG. **1**;

FIG. **3** is a schematic exploded view of FIG. **1** from another viewpoint;

FIG. **4** is a schematic view of a housing in the illuminator device provided by the example of the present disclosure;

FIG. **5** is a schematic view of the housing in FIG. **4** from another viewpoint;

FIG. **6** is a schematic view of the housing in FIG. **4** from still another viewpoint;

FIG. **7** is a schematic view of a heat dissipation member in the illuminator device provided by the example of the present disclosure; and

FIG. **8** is a schematic sectional view along the A-A line in FIG. **1**.

DETAILED DESCRIPTION

In order to make objects, technical details and advantages of the examples of the disclosure apparent, the technical solutions of the examples will be described in a clearly and fully understandable way in connection with the examples of the disclosure and related drawings. Apparently, the described examples are just a part but not all of the examples of the disclosure. Based on the described examples herein, those skilled in the art can obtain other example(s), without any inventive work, which should be within the scope of the disclosure.

The terminology used in the present disclosure is for the purpose of describing exemplary examples only and is not intended to limit the present disclosure. As used in the present disclosure and the appended claims, the singular forms "a," "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It shall also be understood that the terms "or" and "and/or" used herein are intended to signify and include any or all possible combinations of one or more of the associated listed items, unless the context clearly indicates otherwise.

It shall be understood that, although the terms "first," "second," "third," and the like may be used herein to describe various information, the information should not be limited by these terms. These terms are only used to distinguish one category of information from another. For example, without departing from the scope of the present disclosure, first information may be termed as second information; and similarly, second information may also be termed as first information. As used herein, the term "if" may be understood to mean "when" or "upon" or "in response to" depending on the context.

Some heat dissipation structures may be made of aluminum alloy and provided with a plurality of fins which are closely arranged, so the structure is complex. Thus, the entire lamp has large weight, which exceeds the weight that a lamp holder (e.g., the standard lamp holder E27 or E40) of the lamp can bear. Therefore, the illuminator device also needs to be additionally equipped with a safety chain. The

safety chain is connected between a mounting bracket and a light source, thus not only increasing the cost of the high-power lamp but also being inconvenient to replace the light source.

FIG. **1** to FIG. **3** illustrate an illuminator device **100** provided by the example of the present disclosure, which is a high-power light bulb. The illuminator device **100** includes a housing **1**, a heat dissipation member **2** provided at an end of the housing **1**, a light source module **5** configured to include an end in thermal contact with the heat dissipation member **2**, an optical member **6** provided at another end of the light source module **5**, an encloser **7** connected with the light source module **5** and configured to position the optical member **6** at the end of the light source module **5**, a lamp holder **3** connected to another end of the housing **1**, and a driving power supply module **4** accommodated into the housing **1** and electrically connected with the light source module **5**. In the illuminator device **100**, the light source module **5** and the housing **1** are respectively provided at two ends of the heat dissipation member **2**. The heat dissipation member **2** is in thermal contact with the light source module **5**, so that the heat emitted by the light source module **5** can be transferred to the heat dissipation member **2** and then be dissipated to the outside of the illuminator device **100** through the heat dissipation member **2**. The heat transfer medium may be air or other heat-conducting materials.

As shown in FIG. **8**, a plurality of channels **8** communicating the inside of the illuminator device **100** with the outside of the illuminator device **100** are provided in the illuminator device **100**. In the illuminator device **100**, each channel **8** penetrates through the housing **1**, the heat dissipation member **2** and the encloser **7**. The channels **8** can realize the convection between the air outside the illuminator device **100** and the air inside the illuminator device **100**. The illuminator device **100** may be a high-power LED lamp for indoor lighting, which may be mounted on a mounting base such as a ceiling. The lamp holder **3** is electrically connected with the internal driving power supply module so as to electrically connect the illuminator device **100** to the commercial power.

Detailed description will be given below to the components and the connecting relationships between the components in the illuminator device **100**, provided by the example of the present disclosure.

As shown in FIG. **2**, FIG. **4** and FIG. **5**, the housing **1** is in the shape of a cap and is formed in a one-piece form by an insulating material. The housing **1** is provided with a plurality of first through grooves **11** and a plurality of second through grooves **12**. The housing **1** is provided therein with a plurality of first positioning columns **13** connected with the heat dissipation member **2** and a plurality of second positioning columns **14** for supporting the light source module **5**. A horizontal end face is provided at an end of the housing **1** and bonded to an end of the heat dissipation member **2**. The horizontal end face of the housing **1** may be defined to be a first end face **15** of the housing **1**. Another end of the housing **1** is connected with the lamp holder **3**; an outer surface of another end of the housing **1** is provided with screw threads; and the lamp holder **3** may be in threaded connection with the another end of the housing **1**.

Specifically, the first through grooves **11** extend to an outer surface of a side wall of the housing **1** from the first end face **15** of the housing **1**. The first through groove **11** is communicated with at least one channel **8** and includes a first port **111** and a first groove **112** which are communicated with each other. The first port **111** is provided at the first end face **15**. The first groove **112** is formed by denting the outer surface of the side wall. By adoption of the first through grooves **11**, the inner space of the housing **1** may be communicated with the outside of the illuminator device **100**.

Specifically, the second through grooves **12** penetrate through an inner surface and the outer surface of the side wall of the housing **1**. The second through groove **12** is communicated with at least one channel **8**. The second through groove **12** includes two second ports **121** and one second groove **122**, in which the second ports **121** penetrate through the inner surface and the outer surface of the side wall of the housing **1**; the second groove **122** is formed by denting the outer surface of the side wall; and the two second ports **121** are respectively formed on two sides of the second groove **122**. The second through grooves **12** further enhance the communication between the inner space of the housing **1** and the outer space of the illuminator device **100**. Other examples may also adopt the form of only arranging the first through grooves or the second through grooves.

As shown in FIG. **4**, a plurality of first positioning columns **13** are formed inside the housing **1**; a top surface of the first positioning column **13** is flush with the first end face **15**; and a first positioning hole **131** which extends from the top surface of the first positioning column **13** to the outer surface of the housing **1** is formed in the first positioning column **13**. With reference to FIG. **5** and FIG. **8**, a plurality of second positioning columns **14** are provided inside the housing **1**; a top surface of the second positioning column **14** is lower than the first end face **15**; and the top surfaces of the plurality of second positioning columns **14** form a receiving surface for placing the driving power supply module **4** together. Second positioning holes **141** are formed in the second positioning columns **14** respectively. FIG. **6** is a schematic view of the housing in FIG. **4** from another viewpoint.

As shown in FIG. **3** and FIG. **7**, the heat dissipation member **2** is toroidal columnar and made of a metallic material with good thermal conductivity such as aluminum, and the outside diameter of the heat dissipation member **2** is flush with the outside diameter of the housing **1**. The heat dissipation member **2** includes a first end (not signed) and a second end (not signed) arranged in an upper-lower direction, the first end of the heat dissipation member **2** is fixedly connected with the light source module **5**, and the second end of the heat dissipation member **2** is fixedly connected with the hosing **1**. The heat dissipation member **2** includes a round inner ring **21**, a round outer ring **22**, and a plurality of connecting parts **23** extending along a radial direction and connecting the inner ring **21** and the outer ring **22**. Specifically, the inner ring **21** and the outer ring **22** are concentrically arranged, and the plurality of connecting parts **23** extend along a vertical direction and uniformly distributed between the inner ring **21** and the outer ring **22**. The shape of the connecting part **23** is not limited to be a linear plate, or may also be curved, etc. By adoption of the above design, a plurality of pipes **24** extending longitudinally are formed in the heat dissipation member **2**. The pipes **24** are formed due to enclosure of the inner ring **21**, the outer ring **22** and the connecting parts **23**. Moreover, the connecting parts **23** are provided with a plurality of vertical third positioning holes **231** and vertical fourth positioning holes **232**, in which the third positioning holes **231** correspond to the first positioning holes **131**.

As shown in FIG. **2**, FIG. **3**, FIG. **4** and FIG. **7**, the illuminator device **100** further includes a plurality of first screws **16**. The first screws **16** penetrate through the first positioning holes **131** of the first positioning columns **13** and

are accommodated into the third positioning holes **231** to realize the fixed connection between the housing **1** and the heat dissipation member **2**. The wall surfaces of the plurality of pipes **24** of the heat dissipation member **2** are provided with a plurality of vertical protruding strips **25**. The protruding strips **25** are configured to increase the internal surface area of the heat dissipation member **2** and enhance the heat dissipation effect. Other examples may also adopt other connecting means such as bonding connection, fastener connection or welding connection.

The heat dissipation member **2** is preferably made of aluminum profile. The heat dissipation member with required length is cut from an aluminum profile matrix with corresponding diameter according to different lamp powers, luminous fluxes and photoelectric parameters. The powers may range from tens of watts to hundreds of watts, and the luminous fluxes may range from hundreds of lumens to tens of thousands of lumens. The traditional high-power light sources such as high-power fluorescent lamps and high-power metal halide lamps can be well replaced. Meanwhile, one set of aluminum profile mold can obtain a plurality of illuminator devices provided by the example of the disclosure with different powers, so the production cost can be greatly reduced.

As shown in FIG. **2** and FIG. **3**, the light source module **5** includes a second substrate **51**, a light source **52** provided on a side of the second substrate **51**, and a heat homogenization plate **53** provided on another side of the second substrate **51**. The heat homogenization plate **53** is in thermal contact with the heat dissipation member **2**, and emergent light from the light source **52** is emitted at least after light homogenization or light distribution by the optical member **6**. In the example of the present disclosure, the light source adopts a light-emitting diode (LED) light source and is annularly arranged, the light source may be provided to be an annular LED light source, or the light source may be provided to include a plurality of concentric annular LED light sources. In other examples, the light source may adopt TL light sources or other light sources.

The second substrate **51** may be a printed circuit board, and the second substrate **51** is provided with a plurality of fifth positioning holes **511**. The heat homogenization plate **53** is a vacuum cavity having a fine structure at an inner wall, is made of metal with good thermal conductivity such as copper, and is configured to enhance heat dissipation. A surface of the heat homogenization plate **53** is provided with a plurality of sixth positioning holes **531**, and the circumference of the heat homogenization plate **53** is further provided with a plurality of seventh positioning holes **532** and a plurality of clamping grooves **533**. The illuminator device **100** further includes a plurality of second screws **54**. The second screws **54** penetrate through the fifth positioning holes **511** and the sixth positioning holes **531** and are accommodated into the fourth positioning holes **232** to realize the fixed connection between the light source module **5** and the heat dissipation member **2**. Moreover, the light source module **5** is bonded to the first end (not signed) of the heat dissipation member **2**. In other examples, other connecting means such as bonding connection, fastener connection or welding connection may also be adopted.

As shown in FIG. **2** and FIG. **8**, the driving power supply module **4** includes a plurality of elements, including but not limited to an LED driving controller chip, a rectifying chip, a resistor, a capacitor, a fuse wire and a coil, which are all mounted on the first substrate **41** of the driving power supply module **4**; through holes **411** corresponding to four second positioning columns **14** are formed at the first substrate **41**; and the first substrate **41** is provided on a receiving surface in the housing **1**, formed by the four second positioning columns **14**. The illuminator device **100** further includes four third screws **42**. The third screws **42** penetrate through the through holes **411** and are accommodated into the second positioning columns **14** to fix the first substrate **41** in the housing **1**. In other examples, the driving power supply module **4** and the light source module **5** may also be provided in a one-piece form; and the driving power supply module **4** and the light source module **5** may be provided on the same surface or different surfaces of the substrate.

As shown in FIG. **2** and FIG. **3**, in the example of the present disclosure, the optical member **6** adopts a bubble cap, is formed in a one-piece form by an insulating material such as plastic, and is semispherical. The optical member **6** includes a light-transmissive part **61** taken as a central part and protruded out of an upper surface of the encloser **7**, and a horizontal edge part **62** extending to the outside from a side of the light-transmissive part **61**. In the example of the present disclosure, the second substrate **51** of the light source module **5** abuts against the heat dissipation member **2** through the edge part **62**; and a plurality of notches (not shown in the figures) are formed at the edge part **62** of the light-transmissive part **61**. In other examples, a TIR lens, a COB lens, a bulb-cap type light homogenizing shade, or a combination of a lens and a bulb cap may also be taken as the optical member; and as for the annular light source, the optical member may also be correspondingly set to be annular.

As shown in FIG. **2**, FIG. **3**, FIG. **4** and FIG. **8**, the encloser **7** is in the shape of a circular ring and is arranged around the edge part **62** of the optical member **6**. The encloser **7** includes a horizontal part **71** and a first vertical part **72** and a second vertical part **73** which are provided on two sides of the horizontal part **71** respectively. The outside diameter of the encloser **7** is flush with the outside diameter of the heat dissipation member **2**. A plurality of positioning columns **721** and elastic clamping arms **722** are provided at the first vertical part **72**. The positioning columns **721** may cooperate with the seventh positioning holes **532** at the heat homogenization plate **53**. The elastic clamping arms **722** penetrate through the plurality of notches (not shown in the figure) of the edge part **62** and the clamping grooves **533** formed at the edge of the heat homogenization plate **53**, and are clamped into the edge of the heat homogenization plate **53**. Thus, the combination of the encloser **7** and the heat homogenization plate **53** is realized, so the fixed connection between the encloser **7** and the light source module **5** can be realized. A plurality of first openings **711** are formed at the horizontal part **71**. The first openings **711** are aligned with the first through grooves **11** in an upper-lower direction. The pipes **24** are respectively communicated with the first through grooves **11** and the first openings **711**. The first openings **711**, the pipes **24** and the first through holes **11** form the channels **8**. The airflow from the outside of the illuminator device **100** enters the first openings **711**, penetrates through the channels **8** and then the pipes **24** of the heat dissipation member **2**, and is discharged from the first ports **112** and the second ports **122** of the housing **1**, so as to form internal and external convection and achieve effective heat dissipation. In other examples, the encloser may be removed; the structure of the optical member is adjusted and designed to be flush with the outside diameter of the heat dissipation member **2** and be fixedly connected with the heat dissipation member **2**; and the optical member is provided with a structure taken as one part of the channel for heat dissipation.

In summary, the illuminator device **100** provided by the examples of the present disclosure is provided with a plurality of channels communicating the inside of the illuminator device **100** with the outside of the illuminator device **100**; and the channels may be utilized to realize the convection between the air outside the illuminator device **100** and the air inside the illuminator device **100**.

With reference to FIG. **7** and FIG. **8**, the flow of the heat dissipation airflow is divided into at least two parts: one path aligned in the upper-lower direction has a rapid first flow rate; and the other path diffused into the large-size pipes **24** has a second flow rate, the second flow rate is lower than the first flow rate, and the path of airflow can fully exchange heat with the inner walls of the pipes **24**. Thus, the heat emitted by the light source module **5** in the illuminator device **100** can be effectively and rapidly dissipated through the channels **8**. Therefore, the illuminator device **100** has good heat dissipation effect, and then the service life of the light source module **5** in the illuminator device **100** can be prolonged. On the other hand, the heat dissipation member **2** has simple structure and light weight, so the weight of the entire illuminator device **100** is reduced and the light source module **5** may be replaced without the need of the additional installation of a safety chain, so that the illuminator device **100** is easy to assemble and disassemble.

The present disclosure provides an illuminator device with good heat dissipation effect.

The present disclosure provides an illuminator device which includes a housing, a heat dissipation member provided at an end of the housing, a light source module configured to include an end in thermal contact with the heat dissipation member, an optical member provided at an other end of the light source module, and a driving power supply module electrically connected with the light source module, the light source module and the housing are respectively provided at two ends of the heat dissipation member, a plurality of channels communicating inside of the illuminator device with outside of the illuminator device are provided in the illuminator device, and the plurality of channels penetrate through the housing and the heat dissipation member.

Further, the illuminator device further includes an encloser which positions the optical member at the other end of the light source module.

Further, the housing is formed with a plurality of first through grooves; a plurality of pipes are formed in the heat dissipation member; the encloser is provided with a plurality of first openings; the plurality of pipes are respectively communicated with the plurality of first through grooves and the plurality of first openings; and the plurality of first through grooves, the plurality of pipes and the plurality of first openings form the plurality of channels.

Further, each of the first through grooves includes a first port and a first groove which are communicated with each other; the first port is provided at the first end face and communicated with at least one of the plurality of pipes; and the first groove is formed by denting the outer surface of the side wall.

Further, the housing is formed with a plurality of second through grooves; and the plurality of second through grooves penetrate through both an inner surface and the outer surface of the side wall of the housing.

Further, each of the second through grooves includes at least one second port and a second groove which are communicated with each other; the at least one second port penetrates through the inner surface and the outer surface of the side wall of the housing and is communicated with at least one of the plurality of pipes; and the second groove is formed by denting the outer surface of the side wall.

Further, the heat dissipation member is toroidal columnar and includes an inner ring, an outer ring and a plurality of connecting plates connecting the inner ring and the outer ring; and the plurality of pipes are formed by enclosure of the inner ring, the outer ring and the plurality of connecting plates.

Further, the light source module includes a substrate and a light source provided on a side of the substrate; and emergent light from the light source is emitted at least after light homogenization or light distribution by the optical member.

Further, the light source is annularly arranged.

Further, the illuminator device further includes a heat homogenization plate which is provided on another side of the substrate and is in thermal contact with the heat dissipation member.

Further, the light source module and the driving power supply module are separately provided; and the driving power supply module is fixed in the housing.

Further, the light source module and the driving power supply module are provided in a one-piece form.

Further, the optical member includes an edge part and a central part; the encloser is provided around the edge part of the optical member; and the central part of the optical member is protruded out of an upper surface of the encloser.

Further, the encloser is combined with the heat homogenization plate.

Further, the heat dissipation member includes a first end and a second end arranged in an upper-lower direction; and the housing is fixedly connected with the second end of the heat dissipation member and bonded to the second end.

Further, the heat dissipation member includes a first end and a second end arranged in an upper-lower direction; and the light source module is fixedly connected with the first end of the heat dissipation member and bonded to the first end.

Further, the illuminator device further includes a lamp holder which is electrically connected with the driving power supply module and configured to electrically connect the illuminator device to an external power supply.

Compared with other implementations, in the illuminator device provided by the examples of the present disclosure, by utilization of an external heat dissipation member and the arrangement of a plurality of channels communicating the inside of the illuminator device with the outside of the illuminator device, the convection between the air outside the illuminator device and the air inside the illuminator device can be realized by utilization of the channels. Thus, the heat emitted by the light source module in the illuminator device can be effectively and rapidly dissipated through the channels. Therefore, the illuminator device has good heat dissipation effect, and then the service life of the light source module in the illuminator device is prolonged.

The present disclosure provides a method of manufacturing an illuminator device. The method may include: providing a housing and a heat dissipation member provided at an end of the housing, providing a light source module configured to include an end in thermal contact with the heat dissipation member, providing an optical member provided at an other end of the light source module, and providing a driving power supply module electrically connected with the light source module, and where the light source module and the housing are respectively provided at two ends of the heat dissipation member, a plurality of channels communicating inside of the illuminator device with outside of the illumi-

nator device are provided in the illuminator device, and the plurality of channels penetrate through the housing and the heat dissipation member.

The present disclosure may include dedicated hardware implementations such as application specific integrated circuits, programmable logic arrays and other hardware devices. The hardware implementations can be constructed to implement one or more of the methods described herein. Applications that may include the apparatus and systems of various examples can broadly include a variety of electronic and computing systems. One or more examples described herein may implement functions using two or more specific interconnected hardware modules or devices with related control and data signals that can be communicated between and through the modules, or as portions of an application-specific integrated circuit. Accordingly, the computing system disclosed may encompass software, firmware, and hardware implementations. The terms "module," "sub-module," "circuit," "sub-circuit," "circuitry," "sub-circuitry," "unit," or "sub-unit" may include memory (shared, dedicated, or group) that stores code or instructions that can be executed by one or more processors. The module refers herein may include one or more circuit with or without stored code or instructions. The module or circuit may include one or more components that are connected.

The foregoing examples are provided for further detailed description of the objectives, the technical solutions and the advantages of the present disclosure. It should be understood that the foregoing is only the examples of the present disclosure and not intended to limit the present disclosure. Any modification, equivalent replacement, improvement or the like made within the spirit and the principle of the present disclosure shall fall within the scope of protection of the present disclosure.

In addition, it should be also noted that: the language used in the description is mainly selected for the purpose of readability and teaching, and is not selected for the purpose of explaining or limiting the subject of the present disclosure. Therefore, many modifications and variations will be apparent to those skilled in the art without departing from the scope and the spirit of the disclosure. The disclosure of the present disclosure is illustrative and not restrictive as for the scope of the disclosure.

What is claimed is:

1. An illuminator device, comprising:

a housing,

a heat dissipation member provided at an end of the housing,

a light source module configured to comprise an end in thermal contact with the heat dissipation member,

an optical member provided at an other end of the light source module,

an encloser which positions the optical member at the other end of the light source module, and

a driving power supply module electrically connected with the light source module,

wherein the light source module and the housing are respectively provided at two ends of the heat dissipation member, a plurality of channels communicating inside of the illuminator device with outside of the illuminator device are provided in the illuminator device, and the plurality of channels penetrate through the housing and the heat dissipation member, and

wherein the housing comprises a plurality of first through grooves; a plurality of pipes are disposed in the heat dissipation member; the encloser is provided with a plurality of first openings; the plurality of pipes are respectively communicated with the plurality of first through grooves and the plurality of first openings; and the plurality of first through grooves, the plurality of pipes and the plurality of first openings form the plurality of channels.

2. The illuminator device according to claim **1**, wherein the housing is provided with a first end face in contact with an end of the heat dissipation member; and the plurality of first through grooves extend to an outer surface of a side wall of the housing from the first end face.

3. The illuminator device according to claim **2**, wherein each of the first through grooves comprises a first port and a first groove which are communicated with each other; the first port is provided at the first end face and communicated with at least one of the plurality of pipes; and the first groove is formed by denting the outer surface of the side wall.

4. The illuminator device according to claim **3**, wherein the housing is further comprises a plurality of second through grooves; and the plurality of second through grooves penetrate through both an inner surface and the outer surface of the side wall of the housing.

5. The illuminator device according to claim **4**, wherein each of the second through grooves comprises at least one second port and a second groove which are communicated with each other; the at least one second port penetrates through the inner surface and the outer surface of the side wall of the housing and is communicated with at least one of the plurality of pipes; and the second groove is formed by denting the outer surface of the side wall.

6. The illuminator device according to claim **1**, wherein the heat dissipation member is toroidal columnar and comprises an inner ring, an outer ring and a plurality of connecting parts connecting the inner ring and the outer ring; and the plurality of pipes are formed by enclosure of the inner ring, the outer ring and the plurality of connecting parts.

7. The illuminator device according to claim **1**, wherein the light source module comprises a substrate and a light source provided on a side of the substrate; and emergent light from the light source is emitted at least after light homogenization or light distribution by the optical member.

8. The illuminator device according to claim **7**, wherein the light source is annularly arranged.

9. The illuminator device according to claim **1**, wherein the illuminator device further comprises a heat homogenization plate which is provided on an other side of the substrate and is in thermal contact with the heat dissipation member.

10. The illuminator device according to claim **1**, wherein the light source module and the driving power supply module are separately provided; and the driving power supply module is fixed in the housing.

11. The illuminator device according to claim **1**, wherein the optical member comprises an edge part and a central part; the encloser is provided around the edge part of the optical member; and the central part of the optical member is protruded out of an upper surface of the encloser.

12. The illuminator device according to claim **1**, wherein the illuminator device further comprises a heat homogenization plate; and the encloser is combined with the heat homogenization plate.

13. The illuminator device according to claim **1**, wherein the heat dissipation member comprises a first end and a second end arranged in an upper-lower direction; and the housing is fixedly connected with the second end of the heat dissipation member and bonded to the second end.

14. The illuminator device according to claim 1, wherein the heat dissipation member comprises a first end and a second end arranged in an upper-lower direction; and the light source module is fixedly connected with the first end of the heat dissipation member and bonded to the first end.

15. The illuminator device according to claim 14, wherein the optical member is a lens or a diffusion shade.

16. The illuminator device according to claim 1, wherein the illuminator device further comprises a lamp holder which is electrically connected with the driving power supply module and configured to electrically connect the illuminator device to an external power supply.

17. A method of manufacturing an illuminator device, comprising:

providing a housing and a heat dissipation member provided at an end of the housing,

providing a light source module configured to comprise an end in thermal contact with the heat dissipation member,

providing an optical member provided at an other end of the light source module,

providing an encloser which positions the optical member at the other end of the light source module, and

providing a driving power supply module electrically connected with the light source module,

wherein the light source module and the housing are respectively provided at two ends of the heat dissipation member, a plurality of channels communicating inside of the illuminator device with outside of the illuminator device are provided in the illuminator device, and the plurality of channels penetrate through the housing and the heat dissipation member, and

wherein the housing comprises a plurality of first through grooves; a plurality of pipes are disposed in the heat dissipation member; the encloser is provided with a plurality of first openings; the plurality of pipes are respectively communicated with the plurality of first through grooves and the plurality of first openings; and the plurality of first through grooves, the plurality of pipes and the plurality of first openings form the plurality of channels.

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